

## ALLIED VEHICLE TESTING PUBLICATIONS

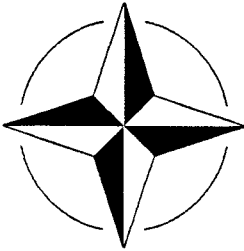
### TRIAL SERIES 00

### GENERAL SUBJECTS

AVTP	TEST TITLE
00 - 01	Philosophy of Testing and Evaluation
00 - 02	Quality Assurance
00 - 03	Measurement and Calibration
00 - 04	Government Vehicle Test Programme
00 - 05	Government Vehicle Test Report
00 - 06	Glossary and Definitions
00 - 07	Categories of Military Vehicles
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00 - 10	List of Test Facilities per Country
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VEHICLE TESTING  
PUBLICATION

AVTP : 00-01  
EDITION NO.: FINAL  
DATE : SEP. 1991



NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : PHILOSOPHY OF TESTING  
AND EVALUATION

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : The role of Testing and Evaluation  
is shown in a flow diagram.

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NORTH ATLANTIC TREATY ORGANISATION  
MILITARY AGENCY FOR STANDARDIZATION (MAS)

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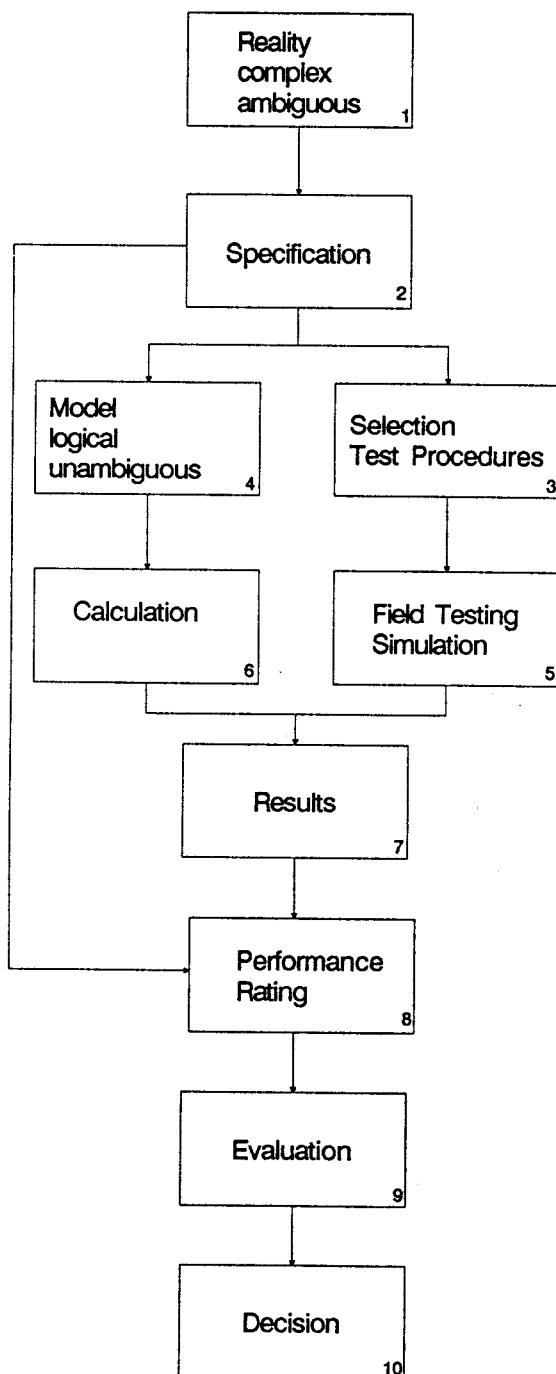
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Trial Series: GENERAL SUBJECTS

Test Title : PHILOSOPHY OF TESTING AND EVALUATION



The start of a new project (1) (e.g. main battle tank) is encompassed by a complex and ambiguous reality. The perception of the threat, aims and resources, future use in both peace and war of, for example, a main battle tank with "kill" and "survive" properties will lead to many different opinions.

The definition of the specifications (2) for a new project described in user requirements, technical specifications, legal regulations etc. must be unambiguous: one of several alternatives is chosen.

By selecting appropriate test procedures (3) or models (4) field testing/simulation (5) and/or calculations (6) are carried out.

The results (7) out of (5) and (6) are compared with the specifications (2) to rate the performance (8). They can also be used to correct (or modify) the models (e.g. the NATO REFERENCE MOBILITY MODEL "NRMM").

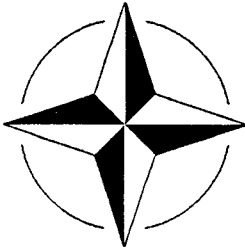
On the basis of the performance rating (8) the evaluation (9) can be carried out using adequate evaluation procedures.

The results of the evaluation are used for decisions (10).

The scope of work for WGE 3 encompasses (3) through (9).

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NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : QUALITY ASSURANCE OF TESTS

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP describes measures to  
guarantee the quality of the  
service offered by the Test  
Centre.

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Trial Series: GENERAL SUBJECTS

Test Title : QUALITY ASSURANCE OF TESTS

- Paragraph 1. SCOPE
2. ADMINISTRATION AND CALIBRATION OF MEASURING INSTRUMENTS
- 2.1 Test Instrument History File
- 2.2 Periodic Calibration
- 2.3. Calibrating Equipment
3. ADMINISTRATIVE PROCEDURES - TRIALS FILE
- 3.1 Composition
- 3.2 Trials Request
- 3.3 Preparation: Trials Programme and Estimates
- 3.4 Trials Orders
- 3.5 Running of Trials: Record and Results
- 3.6 Summary: Presentation of Trial Results
4. PROCEDURES

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1. SCOPE

The quality assurance of tests is based on three requirements:

- 1 - The administration and calibration of measurement and test instrumentation.
- 2 - The establishment of administrative procedures.
- 3 - The adherence to well defined procedures which are compatible with AVTPs.

2. ADMINISTRATION AND CALIBRATION OF MEASURING INSTRUMENTS

2.1 Test Instrument History File

The basic record is the test instrument history file which gives details of the technical and administrative life of each instrument in the trials centre.

A record must be kept of all work carried out on the test equipment. This assists in arranging the periodic calibration, of the instruments.

2.2 Periodic Calibration

Each item of test measurement instrumentation at the trial centre is recorded in the calibration file and must have a label indicating last and next calibration date.

New or repaired instrumentation is to be calibrated and the calibration label attached or updated. Record all calibrations in the calibration file.

2.3. Calibrating Equipment

The calibrating laboratory should be air conditioned and maintained at a stable temperature. From time to time the calibrating instruments must be sent to approved laboratories for calibration. Their history is also recorded in the relevant file.

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3. ADMINISTRATIVE PROCEDURES - TRIALS FILE

3.1 Composition

The trials file is started and annotated by the trials officer as the trial progresses. The trials Officer keeps and administers the file.

The file should contain the following relevant documentation:

- . trials request,
- . test plan,
- . estimates,
- . trials orders ,
- . trials record and results,
- . trials report.

3.2 Trials Request

This consists of the requesting authority's requirements. It must be sent to the Trials Officer as soon as possible, so that there is enough time to make the necessary preparations and programme the trial.

The requesting authority and the Trials Centre must work together; those responsible in each case are specifically nominated.

3.3 Preparation: Test Plan and Estimates

These documents are sent for approval to the requesting authority or service. They are the response to the trials request.

The trial can only start once the requesting authority has given its approval.

3.3.1 Test plan

This is a plan giving full details of all activities involved in the trial and gives the Trials Officer all the information needed to carry out the trial under the required conditions.

The detail will vary depending on the content of the trial.

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The test plan should include:

- . aims of trial,
- . identification of equipment to be tested,
- . responsibilities,
- . programme definition,
- . pre-trial activities,
- . procedures to be used,
- . choice of test methods and instruments,
- . observations,
- . security, protection and safety,
- . trials interface and installation,
- . programme of operation,
- . presentation of results,
- . safety,
- . post trials activities
- . approval.

The testplan must be followed exactly. Any changes must be approved by the requesting authority.

3.3.2 Estimates

Time and cost estimates are based on the test plan.

3.4 Trials Orders

Approval by the requesting authority of the test plan content as well as the cost estimate is necessary before the authorisation to proceed can be given.

3.5 Running of Trials: Record and Results

A trial consists of all the operations laid down in the test plan and the noting of all information confirming that the test plan has been followed.

The Trials Officer must therefore strictly apply the procedures laid down and, in particular, make no changes without prior approval.

The Trials Officer must have at his disposal:

- . the approved test plan,
- . the trials centre procedures,
- . procedures for dealing with incidents,
- . information on the test item.

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The Trials Officer must produce the following:

- . trials record
- . factual data
- . subjective comments.

### 3.5.1 Trials Record

This record must contain all references and information related to the trial, the names and functions of the persons involved, and must be updated as the different operations are carried out, i.e.:

- . takeover of equipment for trial (identification, hand-over operations...),
- . date and time of start of trial,
- . starting conditions,
- . details and order of the various operations,
- . record of any incidents during trial,
- . conditions resulting in any stoppages, and continuation, of trial,
- . final checks,
- . date and time of end of trial,
- . repacking of equipment prior to return.

This record contains notes and real times of every occurrence during the trial.

It is kept up to date by the Trials Officer and is used for establishing the trials report.

### 3.5.2 Results of Trials

Partial results are contained in the trials record, a copy of which is sent to the requesting authority.

In some cases, and with the agreement of both parties, these results can form a separate document.

They make it possible to:

- . confirm that the test plan has been properly carried out,
- . give, in real time, certain results, concerning the behaviour of equipment under trial,
- . take decisions on the stopping, restarting or continuation of the trial.

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### 3.5.3 Incidents

. Definition of an incident:

An incident is either

- a departure from the test plan or request, or
- a breakdown of test, measuring or auxiliary equipment, or of the equipment under trial or any event not foreseen in the test plan.

. Interruption of trial:

Apart from specific cases of emergency stops laid down in the test plan, an operator may have to stop a trial temporarily. He will then immediately notify all concerned make a note in the trials record and may, if in the trial, required, write out an incident report.

. Writing of incident report:

Whenever an incident occurs, whether it stops the trial or not, the trials officer may, if required, write an incident report. This is sent at once to all those concerned in the trial.

. Action on incidents:

Action must be taken on all incident reports. This is the responsibility of the different officials dealing with the trial.

Solutions must be agreed by all those responsible for the trial.

Depending on the conclusions of an analysis of the incident, possible solutions can be:

- to continue the trial, with or without modification
- a return to the beginning of the trial, with or without modifying trials equipment or test plan,
- stopping the trial completely.

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. Correction measures:

The trials centre and the officials responsible for the equipment under trial must have a certain number of corrective measures at their disposal, such as:

. for the trials centre:

- spare parts (in the framework of an appropriate maintenance policy).

. for the official responsible for the equipment under trial

- possibility of working on the equipment,
- possibility of replacing the equipment under trial,
- possibility of modifying the trials programme (and trials procedure, if there is one),
- etc ...

3.5.4 Control of funds and timetables

The Trials Officer and the subcontractors must fulfil their obligations with regard to funding and timetables.

The working plan laid down in the test plan must be adhered to.

The Trials Officer must inform the requesting authority of any changes in writing, if necessary by means of an internal note, a copy of which will be included in the trials file.

3.6 Summary: Presentation of Trial Results

3.6.1 Type of document

The results of trials carried out in conformity with the test plan will be contained in a document.

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3.6.2 Contents of trials report

Because of the contractual value of this document,  
it may include:

- . a section dealing with general and administrative information,
- . a section dealing with technical information.

4. PROCEDURES

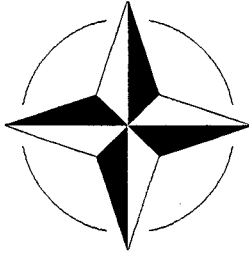
Trials are carried out according to procedures laid down the relevant services. These procedures are based on those contained in applicable NATO agreements. They give precise explanations of the way the different operations are to be carried out.

They will be approved by the "Methods and Quality" service, or its equivalent, designated by the trials centre.



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NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : MEASUREMENT AND CALIBRATION

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP contains general information on the subject of Measurement and Calibration.

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Trial Series : GENERAL SUBJECTS

Test Title : MEASUREMENT AND CALIBRATION

Paragraph	1.	SCOPE
	2.	MEASUREMENT
	2.1	Error and Uncertainty
	2.2	Measurement Process
	2.3	Result of a Measurement
	2.4	Uncertainty of Measurement
	2.5	(Absolute) Error of Measurement
	2.6	Relative Error
	2.7	Practical Considerations
	3.	CALIBRATION
	3.1	General
	3.2	Definition

ANNEX A: QUANTITIES, UNITS AND PERMISSIBLE ERRORS

ANNEX B: INTERNATIONAL REFERENCES AND ORGANISATIONS:  
BIPM, IEC, ISO, OIML, IUPAP

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1. SCOPE

The subject of measurement and calibration has been discussed in numerous national and international publications. This has led to the standardization of terms, quantities, units and statistical methods.

This AVTP emphasizes only those aspects of measurement and calibration which are important for testing of wheeled and tracked vehicles.

The administrative aspects with respect to measurement and calibration are described in AVTP 00-02.

2. MEASUREMENT

2.1 Error and Uncertainty (See BIPM, Foreword)

All measurements are tainted by error. But this error is generally not known. Its sign is often ignored and it is often difficult even to give it an order of magnitude. It is for this reason that the word "uncertainty" is coming increasingly into use to designate "the estimate of the possible error, of unknown sign". Nonetheless one must be careful not to apply indiscriminately the language of statistics to the concept of uncertainty as the estimation of an uncertainty is rarely a matter of rigorous statistical analysis.

2.2 Measurement Process (BIPM, 2.08)

All the information, equipment and operations relevant to a given measurement.

Note: This concept embraces all aspects relating to the performance and quality of the measurement; it includes for example the principle, method, procedure, values of the influence quantities and the measurement standards.

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2.3 Result of a Measurement (BIPM, 3.01)

The value of a measurand obtained by measurement.

Notes: 1. When the term "result of a measurement" is used,  
it should be made clear whether it refers to

- the indication,
- the uncorrected result,
- the corrected result,

and whether averaging over several observations  
is involved.

2. A complete statement of the result of a measurement  
includes information about the uncertainty of measure-  
ment and about the values of appropriate influence  
quantities.

2.4 Uncertainty of Measurement (BIPM, 3.09) \*

An estimate characterizing the range of values within  
which the true value of a measurand lies.

Note: Uncertainty of measurement comprises, in general, many  
components. Some of these components may be estimated on  
the basis of the statistical distribution of the results  
of series of measurements and can be characterized by  
experimental standard deviations. Estimates of other com-  
ponents can only be based on experience or other information.

2.5 (Absolute) Error of Measurement (BIPM, 3.10)

The result of a measurement minus the conventional (true)  
value of the measurand.

Notes: 1. The term relates equally to

- the indication,
- the uncorrected result,
- the corrected result.

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2. The known parts of the error of measurement may be compensated by applying appropriate corrections. The error of the corrected result can only be characterized by an uncertainty.
3. "Absolute error", which has a sign, should not be confused with absolute value of an error which is the modulus of an error.

For the purpose of tests the "Permissible Error of Measurement<sup>\*)</sup>" is given in paragraph 2 of the AVTPs based on the list in ANNEX A and refers to the instrumentation, rather than the measurement.

The statistical statement

" The permissible error of measurement for instrumentation is the two-sigma value for a normal distribution, thus, the stated errors should not be exceeded in more than 1 measurement of 20"

can be referred to the "Experimental Standard Deviation" (BIPM, 3.08) which reads as follows:

For a series of n measurements of the same measurand, the parameter "s" characterizing the dispersion of the results is given by the formula:

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$$

$x_i$  being the result of the  $i$ th measurement and  $\bar{x}$  being the arithmetic mean of the n results considered.

Notes: 1. The experimental standard deviation should not be confused with the population standard deviation  $\sigma$  of a population of size N and of mean m, given by the formula:

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$$\sigma = \sqrt{\frac{\sum_{i=1}^N (x_i - m)^2}{N}}$$

2. Considering the series of  $n$  measurements as a sample of a population,  $s$  is an estimate of the population standard deviation.
3. The expression  $s/\sqrt{n}$  provides an estimate of the standard deviation of the arithmetic mean  $\bar{x}$  with respect to the mean  $m$  of the overall population. The expression  $s/\sqrt{n}$  is called the experimental standard deviation of the mean.

## 2.6 Relative Error (BIPM 3.11)

The absolute error of measurement divided by the conventional (true) value of the measurand.

## 2.7 Practical Considerations

Any measurement is by nature a compromise between the ideal achievement of results and expediency in which the following may be included: personnel, equipment, time and cost. In general, the more difficult the measurement, the more complex the method required in order to carry it out.

The approach to measurement is an important facet and a decision must be made as to precisely what the measurement is required to achieve. It must be decided whether the requirement is for a qualitative or quantitative measurement.

If the latter, what resolution and accuracy will be required. When the appropriate measurement technique has been selected, care should be taken to ensure that it is compatible with the form of data presentation required to facilitate the production of results.

The following are among the features to be considered in determining the method and choice of equipment:



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#### Simplicity

Experimental method and equipment should be as simple as possible. The degree of complexity should only be enough to achieve the required result. Simple equipment is easier to operate with a reduced chance of systematic errors.

#### Minimum Interference with the Measured Object or Process.

Interference with the measured process by the measurement system is generally unavoidable and must be kept to a minimum. It is essential that the process of measurement does not attribute unwarranted characteristics to the measured process.

#### Minimum Transformation Stages.

There should be the minimum number of transformation stages between the transducer and the recording or observation stage.

#### Reliability and Repeatability.

Selected methods should be both reliable and repeatable.

#### Need

The measurement to be made must be needed. Resources and time can be wasted by taking measurements for which there is no requirement or use. Assure the measurement is required by the test plan or is needed to address a test issue.

#### Errors

Due consideration must be given to the accuracy of derived results which are generated from directly measured parameters. It should be noted that, in many cases, the resultant will be less accurate than the original measurements.

### 3. CALIBRATION

#### 3.1 General

Calibration will be required in order to make worthwhile quantitative measurements. If the measurements are dynamic, then calibration should also be made dynamically. For static or quasi-static measurement, a static calibration should be made using the same components (e.g. leads and signal processing chain) as used for the measurements. Ease of calibration and consistency are most desirable, and equipment should be selected with this in mind. For best results, a calibration check should be made before each experiment is carried out.

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Calibration should always be carried out against a standard which is traceable to a national or international standard.

3.2 Definition of the term "Calibration". (BIPM, 6.13)

The set of operations which establish, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system, or values represented by a material measure, and the corresponding known values of a measurand.

- Notes:
1. The result of a calibration permits the estimation of errors of indication of the measuring instrument, measuring system or material measure, or the assignment of values to marks on arbitrary scales.
  2. A calibration may also determine other metrological properties.
  3. The result of a calibration must be recorded in a document, sometimes called a calibration certificate or a calibration report.
  4. The result of a calibration is sometimes expressed as a calibration factor, or as a series of calibration factors in the form of a calibration curve.

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## ANNEX A

## QUANTITIES, UNITS AND PERMISSIBLE ERRORS

## GRANDEURS, UNITES ET ERREURS DE MESURE ACCEPTABLE

This list provides recommendations concerning units and accuracies when writing AVTPs, but does not take precedence over the accuracies specified in existing AVTPs.

DEVICES FOR MEASUREMENT OF: APPAREILS DE MESURE DE:		PERMISSIBLE ERROR OF MEASUREMENT: ERREUR DE MESURE ACCEPTABLE:		UNIT:
				UNITE:
ACCELERATION	ACCELERATION	2% of measured value	(de la valeur de la mesure)	m/s <sup>2</sup>
AIR FLOW	DEBIT D'AIR	10% of measured value	(de la valeur de la mesure)	m <sup>3</sup> /s
AIR SPEED	VITESSE DE L'AIR	5% of measured value	(de la valeur de la mesure)	m/s
ALTITUDE	ALTITUDE	1% of measured value	(de la valeur de la mesure)	m
ANGLE (DYNAMIC MEASUREMENT)	ANGLE (MESURE DYNAMIQUE)	20 mrad		rad
ANGLE (STATIC MEASUREMENT)	ANGLE (MESURE STATIQUE)	10 mrad		rad
CONCENTRATION (GAS)	CONCENTRATION (GAZEUSE)	5% of measured value	(de la valeur de la mesure)	
CONCENTRATION (LIQUID)	CONCENTRATION (LIQUIDE)	10% of measured value	(de la valeur de la mesure)	
CONCENTRATION (PARTICLE)	CONCENTRATION (PARTICULE)	10% of measured value	(de la valeur de la mesure)	
CONE INDEX	INDICE DE CONE	10% of measured value	(de la valeur de la mesure)	
CURRENT	INTENSITE	3% of measured value	(de la valeur de la mesure)	A
DENSITY (ELECTROLYTE)	DENSITE (ELECTROLYTE)	0.5% of measured value	(de la valeur de la mesure)	kg/m <sup>3</sup>
DENSITY (SOIL)	DENSITE (SOIL)	5% of measured value	(de la valeur de la mesure)	kg/m
DIMENSIONS	DIMENSIONS	0.3% of measured value	(de la valeur de la mesure)	m
DIMENSIONS	DIMENSIONS	3% of measured value, less critical measurement	(de la valeur de la mesure, mesure moins critique)	m
DISPLACEMENT	DEPLACEMENT	2% of measured value	(de la valeur de la mesure)	m
DISTANCE	DISTANCE	2% of measured value	(de la valeur de la mesure)	m
EXHAUST-SMOKE DENSITY	DENSITE DE GAZ D'ECHAPPEMENT	5% of full scale	(à fond d'échelle)	deg. Hartridge
FORCE (DYNAMIC)	FORCE (DYNAMIQUE)	2% of measured value	(de la valeur de la mesure)	N
FORCE (STATIC)	FORCE (STATIQUE)	1% of measured value	(de la valeur de la mesure)	N
FUEL CONSUMPTION	CONSUMMATION DE CARBURANT	2% of measured value	(de la valeur de la mesure)	l/h or l/km
HUMIDITY (RELATIVE)	HYGROMETRIE	3% of full scale	(à fond d'échelle)	
ILLUMINATION (LEVEL OF)	ECLAIREMENT	5% of measured value	(de la valeur de la mesure)	lx
LUMINANCE	LUMINANCE	5% of measured value	(de la valeur de la mesure)	cd/m <sup>2</sup>
MASS	MASS	1% of measured value	(de la valeur de la mesure)	kg
OIL CONSUMPTION	CONSUMMATION D'HUILE	5% of measured value	(de la valeur de la mesure)	l/km
PRESSURE (ATMOSPHERIC)	PRESSION (ATMOSPHERIQUE)	1% of measured value	(de la valeur de la mesure)	Pa
PRESSURE (GAS)	PRESSION (GAZ)	5% of measured value	(de la valeur de la mesure)	Pa
PRESSURE (LIQUID)	PRESSION (LIQUIDE)	5% of measured value	(de la valeur de la mesure)	Pa
PRESSURE (TYRE)	PRESSION DES PNEUS	10 kPa		Pa
RADIANT INTENSITY	RADIATION	5% of measured value	(de la valeur de la mesure)	W/sr
RADIATION (HEAT)	RAYONNEMENT THERMIQUE	5% of measured value	(de la valeur de la mesure)	W/m <sup>2</sup>
ROTATIONAL FREQUENCY	VITESSE DE ROTATION	2% of measured value	(de la valeur de la mesure)	rev/s
SOIL MOISTURE CONTENT	HUMIDITE DU SOL	2% of full scale	(à fond d'échelle)	
SOUND PRESSURE LEVEL	NIVEAU DE PRESSION ACOUSTIQUE	1.5 dB(A)		dB
SPEED (ANGULAR)	VITESSE (ANGULAR)	2% of measured value	(de la valeur de la mesure)	rad/s
SPEED (ANGULAR)	VITESSE (ANGULAR)	5% of measured value, less critical measurement	(de la valeur de la mesure, mesure moins critique)	rad/s
SPEED (VEHICLE)	VITESSE (VEHICLE)	1% of measured value	(de la valeur de la mesure)	km/h
SPEED (VEHICLE)	VITESSE (VEHICLE)	5% of measured value, less critical measurement	(de la valeur de la mesure, mesure moins critique)	km/h
SPEED (WATER)	COURANT	5% of measured value	(de la valeur de la mesure)	m/s
SPEED (WIND)	VITESSE DU VENT	5% of measured value	(de la valeur de la mesure)	m/s
TEMPERATURE	TEMPERATURE	1°C		°C
TIME	TEMPS	1% of measured value	(de la valeur de la mesure)	s,min,h
TIME	TEMPS	5% of measured value, less critical measurement	(de la valeur de la mesure, mesure moins critique)	s,min,h
TORQUE	COUPLE	2% of measured value	(de la valeur de la mesure)	Nm
VOLTAGE	TENSION	1% of measured value	(de la valeur de la mesure)	V
VOLUME (LUBRICANTS)	VOLUME (LUBRIFIANT)	5% of measured value	(de la valeur de la mesure)	l
VOLUME (FUEL)	VOLUME (CARBURANT)	2% of measured value	(de la valeur de la mesure)	l
WEIGHT	POIDS	1% of measured value	(de la valeur de la mesure)	N
WIND DIRECTION	DIRECTION DU VENT	50 mrad		rad

NOTE: The term "of measured value" does not appear in the AVTPs, however, by "2%" 2% of measured value is meant.

AVTP : 00-03  
EDITION NO.: FINAL  
DATE : OCT 1993

ANNEX B

International References and Organizations

References

- |                        |  |
|------------------------|--|
| (1) BIPM               | The International System of Units, SI  |
| (2) ISO 31             | Quantities, Units and Symbols,<br>Parts 0 to 13  |
| (3) ISO 1000           | SI units and recommendations for the use<br>of their multiples and of certain other<br>units |
| (4) ISO GUIDE 30       | Terms and definitions used in connection<br>with reference materials                         |
| (5) ISO-TAG-4          | Guide to the expression of uncertainty in<br>measurement 1st Edition, June 92                |
| (6) IEC Publication 50 | International Electrotechnical Vocabulary,<br>Chapters 111, 151, 301, 302 and 303            |
| (7) OIML               | Vocabulary of Legal Metrology  |
| (8) IUPAP (UIPPA)      | Symbols, Units and Nomenclature in<br>Physics,<br>Document U. I. P. 20                       |

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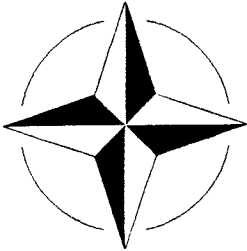
ANNEX B

Organizations

Name	Address
BIPM International Bureau of Weights and Measures	Pavillon de Breteuil F-92 310 Sèvres France
IEC International Electrotechnical Commission	3, rue de Varembè CH-1211 Genève 20 Switzerland/Suisse
ISO International Organization for Standardization	1, rue de Varembè CH-1211 Genève 20 Switzerland/Suisse
OIML International Organization of Legal Metrology	11, rue Turgot F-75009 Paris France
IUPAP International Union of Pure and Applied Physics	c/o Prof. Larkin Kerwin University Laval Quebec, Canada P.Q.G. 1K7 P4

ALLIED  
VEHICLE TESTING  
PUBLICATION

AVTP : 00-04  
EDITION NO.: FINAL  
DATE : SEP. 1991



NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : GOVERNMENT VEHICLE TEST PROGRAMME

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP describes the contents  
of the government vehicle test  
programme.

AVTP : 00-04  
EDITION NO.: FINAL  
DATE : SEP. 1991

NORTH ATLANTIC TREATY ORGANISATION  
MILITARY AGENCY FOR STANDARDIZATION (MAS)

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AVTP : 00-04  
EDITION NO.: FINAL  
DATE : SEP. 1991

Trial Series: GENERAL SUBJECTS

Test Title : GOVERNMENT VEHICLE TEST PROGRAMME

- Paragraph 1. SCOPE
2. CONTENTS OF THE TEST PROGRAMME
- 2.1 Aim of the Test
- 2.2 Documentation
- 2.3. Materiel
- 2.4 Test description
- 2.5 Chronological Order
- 2.6 Estimation of the Costs
- 2.7 Responsibilities

AVTP : 00-04  
EDITION NO.: FINAL  
DATE : SEP. 1991

1. SCOPE

This AVTP gives a brief description of the contents of the government vehicle test programme.

2. CONTENTS OF THE TEST PROGRAMME

2.1 Aim of the Test

Description of the aim of the test, for example:

- to gather information for development of the test item
- to check whether the materiel fulfils the requirements
- to check the quality of production.

2.2 Documentation

List of referenced documents.

2.3 Materiel

Description of the main characteristics of the materiel to be tested, including security and safety aspects.

2.4 Test description

Description of every test to be carried out including:

- the AVTP to be used or a description how the measurements should be performed and the way the results are to be presented
- the test conditions of the materiel (for example load)
- the test parameters (for example: speed, ambient conditions, type of test course).

2.5 Chronological Order

Chronological order of the tests including the time planned for every test. Information about the total time needed to perform the complete programme, including writing the test report.

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2.6 Estimation of the Costs

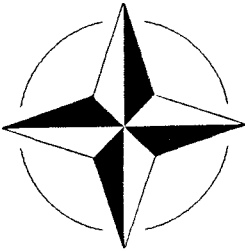
This estimation contains all types of costs (personnel, material, facilities, work done by other institutes). This may be restricted to an estimation of the credit needed to perform the programme.

2.7 Responsibilities

A list of those with specific responsibilities (for example: programme manager, test director).

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NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : GOVERNMENT VEHICLE TEST REPORT

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP describes the contents  
of the government vehicle test  
report.

AVTP : 00-05  
EDITION NO.: FINAL  
DATE : SEP. 1991

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EDITION NO.: FINAL  
DATE : SEP. 1991

Trial Series: GENERAL SUBJECTS

Test Title : GOVERNMENT VEHICLE TEST REPORT

Paragraph 1. SCOPE

2. CONTENTS OF THE TEST REPORT

2.1 General and administrative information

2.2 Technical information

AVTP : 00-05  
EDITION NO.: FINAL  
DATE : SEP. 1991

1. Scope

This AVTP gives a brief description of the contents of the government vehicle test report.

2. Contents of the test report

2.1 General and administrative information

- title and reference number
- name and address of the test centre
- name, function and signature of the responsible member of the test centre
- classification
- date of the tests
- name and address of other laboratories that performed tests (if applicable)
- distribution.

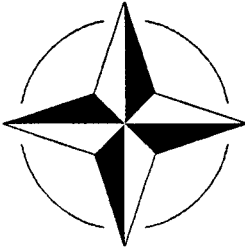
2.2 Technical information

- identification of the materiel tested
- reference list of the following documents:
  - test programme (it is desirable to have a copy in the report)
  - test procedures used
  - documents with the requirements the materiel should fulfil
- description of methods used to carry out the tests, including:
  - apparatus used for the measurements
  - used test tracks
  - any deviation from the test programme
- presentation of the results, including:
  - the achieved accuracy
  - the related requirements
- summary of the results, comments and conclusions/recommendations.



ALLIED  
VEHICLE TESTING  
PUBLICATION

AVTP : 00-06  
EDITION NO.: FINAL  
DATE : SEP. 1991



NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : GLOSSARY AND DEFINITIONS

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP defines specific terms  
used in different AVTP's but not  
defined there.

AVTP : 00-06  
EDITION NO.: FINAL  
DATE : SEP. 1991

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regulations, instrumentation accuracies, etc., the  
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test data by other nations.

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AVTP : 00-06  
EDITION NO.: FINAL  
DATE : SEP. 1991

Trial Series: GENERAL SUBJECTS

Test Title : GLOSSARY AND DEFINITIONS

This glossary applies only to the STANAG 4357 and 4358, when certain terms are used but not specified in the individual AVTP of STANAG 4357.

LIST

TERM	DEFINITION	NOTES
Acceptance Criteria	The agreed operational criteria upon which equipment is accepted into service and against which contractual payments can be made.	
Assessment	The process of comparing results to established criteria to identify the degree of success of a test or trial.	
Data	Information gained from a test	
Data Reduction	The conversion of data to a form which is usable in assessment or evaluation	
Demonstration	The illustration of a particular quality of an equipment or material by the use of a closely defined method and against a set of pre-determined criteria.	
Evaluation	The analysis of a result or a series of results to establish the qualitative worth of a system or subsystem within the environment in which it will operate.	Essentially a comparative exercise in which the results of tests and trials are but part of the input.

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AVTP : 00-06  
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TERM	DEFINITION	NOTES
Growth	A planned and demonstratable progression in the development of a predetermined quality.	
Information	Knowledge of a specific event including data and the conditions surrounding the event.	
Level of Confidence	The proposition "level of confidence should be 95%" is equivalent to "level of significance should be $\alpha = 0.05$ ".	TRIAL SERIES 09 "Ergonomics"
Lifting Point	A specially designed point (eye or similar) for the purposes of lifting the vehicle or load.	TRIAL SERIES 06 "Transportability"
LO-LO	An abbreviation of Lift On - Lift Off, a method of loading the vehicle under test on to a ship using a crane.	TRIAL SERIES 06 "Transportability"
Rating Scale	<p>Rating Scale is used to give a numerical value to a judgement, and provides an objective method for rating attitudes and opinions. When properly constructed, the rating scale accurately reflects both the direction and intensity of difference in attitude or opinion. The results obtained are amenable to analysis by parametric and non-parametric statistical techniques.</p> <p><u>Examples:</u> The following are examples of some various types of rating scales which may be used in the construction of questionnaire.</p>	TRIAL SERIES 09 "Ergonomics"

AVTP : 00-06  
 EDITION NO.: FINAL  
 DATE : SEP. 1991

TERM	DEFINITION	NOTES
	<p><u>Vertical formatting</u></p> <p>9. ( ) Excellent                          8. ( ) Extremely good                          7. ( ) Very good in most re-                          spects                          6. ( ) Good                          5. ( ) Adequate                          4. ( ) Barely                          3. ( ) Not quite                          adequate                          2. ( ) Poor                          1. ( ) Extremely poor</p> <p><u>or:</u></p> <p>6. ( ) Extremely good                          5. ( ) Very good in most re-                          spects                          4. ( ) Moderately good                          3. ( ) Barely adequate                          2. ( ) Poor                          1. ( ) Extremely poor</p> <p><u>or for comparison:</u></p> <p>a. ( ) Much easier                          b. ( ) Easier                          c. ( ) Slightly easier                          d. ( ) About the same                          e. ( ) Slightly more difficult                          f. ( ) Difficult                          g. ( ) Much more difficult</p> <p><u>Horizontal formatting</u></p> <p>Illumination                          POOR 1 2 3 4 5 6 7 8 9 EXCELLENT                          POOR _____ EXCELLENT</p>	<p>Scales for over-                          all rating                          - Acceptability                          - Utility</p>
Ready Access Way	Clear areas around stores or vehicles after loading into an aircraft, permitting the pas- sage of air crew personnel.	TRIAL SERIES 06 "Transportability"

AVTP : 00-06  
 EDITION NO.: FINAL  
 DATE : SEP. 1991

TERM	DEFINITION	NOTES
Result	A set of data which has been subject to assessment or processing and from which conclusions can be drawn.	
RO - RO	An abbreviation of Roll On - Roll Off, a method of loading the vehicle under test on to a ship using a loading ramp.	TRIAL SERIES 06 "Transportability"
Sling	The connector between the lifting equipment (crane or similar) and the load to be lifted. Typical slings may be chain, rope or webbing.	TRIAL SERIES 06 "Transportability"
Statistical Techniques	<p>Comparison of two samples</p> <p>Independent: Kolmogoroff-Smirnoff-Test/ t-Test</p> <p>Dependent: Wilcoxon-Test</p> <p>Comparison of more than two samples</p> <p>Independent: H-Test (Kruskall and Wallis)</p> <p>Dependent: Friedmann-Test, Wilcoxon-Test</p>	TRIAL SERIES 09 "Ergonomics"
Tie Down Point	A specially designed fixing point (eye or similar) for the secure attachment of the vehicle or load to the carrying vehicle.	TRIAL SERIES 06 "Transportability"
Transporter	A vehicle specifically designed to carry as a load another vehicle, generally for ease of movement or speed. Typical example is a tank transporter, i.e. a wheeled vehicle suitable for the carriage of a tracked vehicle.	TRIAL SERIES 06 "Transportability"

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AVTP : 00-06  
EDITION NO.: FINAL  
DATE : SEP. 1991

TERM	DEFINITION	NOTES
Test	A closely defined method of examining a material or equipment against a set of predetermined criteria.	
Trial	A series of tests organized in a systematic manner, the individual data from which contribute to an overall result.	

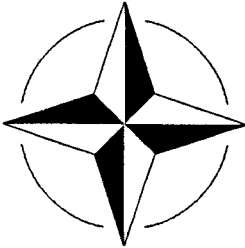
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ALLIED  
VEHICLE TESTING  
PUBLICATION

AVTP : 00-07  
EDITION NO.: FINAL  
DATE : SEP. 1991



NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : CATEGORIES OF MILITARY  
VEHICLES

REFERENCE : STANAG 4357  
STANAG 4358  
STANAG 2021

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : Combat- and Transport-Vehicles are  
categorised on the basis of their  
functions, capabilities and types.

AVTP : 00-07  
EDITION NO.: FINAL  
DATE : SEP. 1991

NORTH ATLANTIC TREATY ORGANISATION  
MILITARY AGENCY FOR STANDARDIZATION (MAS)

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Trial Series: GENERAL SUBJECTS

Test Title : CATEGORIES OF MILITARY VEHICLES

1. SCOPE

The aim of this paper is to categorise Military Vehicles on the basis of their

- Functions F
- Capabilities C
- Types T
- Military Load Classification MLC

2. CLASSIFICATION

To identify a Military Vehicle use the following symbols:

2.1 Functions

2.1.1 Combat Vehicles

- 2.1.1.1 Main Battle Tank F11
- 2.1.1.2 Infantry Fighting Vehicles F12
- 2.1.1.3 Self Propelled Artillery F13
- 2.1.1.4 Reconnaissance Vehicles F14
- 2.1.1.5 Others F15

AVTP : 00-07  
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- 2.1.2 Special Vehicles
  - 2.1.2.1 Recovery Vehicles F21
  - 2.1.2.2 Mobile Crane F22
  - 2.1.2.3 Engineer Vehicles F23
  - 2.1.2.4 Bridge Layer Vehicles F24
  - 2.1.2.5 Mine Layer F25
  - 2.1.2.6 Mine Clearer F26
  - 2.1.2.7 Medical Vehicles F27
  - 2.1.2.8 Fuel Transport Vehicles F28
  - 2.1.2.9 Others F29
- 2.1.3 Transport Vehicles <Load Capacity>
  - 2.1.3.1 Transport Vehicles ≤2t F31
  - 2.1.3.2 Transport Vehicles >2-10t F32
  - 2.1.3.3 Transport Vehicles >10-20t F33
  - 2.1.3.4 Transport Vehicles >20t F34
- 2.2 Capabilities
  - 2.2.1 Cross Country Mobility C1
  - 2.2.2 Amphibious C2
  - 2.2.3 Restricted to Roads/Tracks C3
  - 2.2.4 Air Transportability C4

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2.3 Type

2.3.1	Tracked Vehicles	T1
2.3.2	Wheeled Vehicles	T2
2.3.3	Trailers	T3

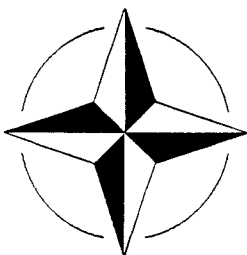
3. EXAMPLES

3.1 Leopard 2, Abrams, Challenger, Leclerc  
F11/C1/T1/MLC

3.2 Heavy Duty Transporter (GE: SLT, US: HET)  
F34/C3/T2,3/MLC 100

ALLIED  
VEHICLE TESTING  
PUBLICATION

AVTP : 00-08  
EDITION NO.: FINAL  
DATE : OCT 1993



NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : MANUFACTURER'S INFORMATION  
SHEET (MIS)

REFERENCE : STANAG 4357  
STANAG 4358  
AVTP 00-07

EQUIVALENT :

FOR COMPLIANCE  
WITH : -

ABSTRACT : The Manufacturer's Information  
Sheet contains the initial in-  
formation on the most important  
data on vehicles for military use.

AVTP : 00-08  
EDITION NO.: FINAL  
DATE : OCT 1993

NORTH ATLANTIC TREATY ORGANISATION  
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DATE : OCT 1993

Trial Series: GENERAL SUBJECTS

Test Title : MANUFACTURER'S INFORMATION SHEET

- Paragraph
1. SCOPE
  2. FACILITIES
  3. REQUIRED CONDITIONS
  4. DATA REQUIRED
  5. PRESENTATION OF DATA

ANNEX A: MANUFACTURER'S INFORMATION SHEET (MIS) for  
TRACKED VEHICLES

ANNEX B: MANUFACTURER'S INFORMATION SHEET (MIS) for  
WHEELED VEHICLES

ANNEX C: MANUFACTURER'S INFORMATION SHEET (MIS) for  
TRAILERS

AVTP : 00-08  
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1. SCOPE

The Manufacturer's Information Sheet (MIS) contains the most important design and performance data of vehicles for military use.

The provisional MIS offers initial and comparable information provided by the manufacturer and based on requirements/specifications, design parameters and manufacturer's test data.

After corrections based on official test data have been added, the MIS can be used as a basis for a data summary of the vehicle.

2. FACILITIES

Design office, development and testing section of the manufacturer.

3. REQUIRED CONDITIONS

3.1 Fighting Vehicles

Equipped for combat (as far as known).

3.2 Transport Vehicles

- Kerb weight without driver.
- Normal payload with driver.

4. DATA REQUIRED

Based on AVTP 00-07 "Categories of Military Vehicles" three different formats of data are required because of the great differences of the vehicles.

4.1 Format for Tracked Vehicles (T1) (ANNEX A).

4.2 Format for Wheeled Vehicles (T2) (ANNEX B).

4.3 Format for Trailers (T3) (ANNEX C).

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The format includes the following 14 paragraphs (as applicable):

1. Identification and Classification
2. Crew, Ergonomics
3. Main Characteristics of the Weapon System
4. Main Characteristics of the Chassis
5. Main Characteristics of Powerpack, Steering- and Braking System
6. Main Characteristics of the Electrical Supply System, Internal Check System
7. Protection - Main Characteristics
8. Command and Control System
9. Other Equipment
10. Dimensions, Weights
11. Automotive Performance Data
12. Performance Data of the Weapon System, Protection, Command and Control System
13. Consumption Data, Operational Limitations
14. Pictorial Presentations

The data collection must not include data higher than "NATO UNCLASSIFIED".

5. PRESENTATION OF DATA

Present the required data in tabular, graphical or pictorial format as appropriate.

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ANNEX A

Manufacturer's Information Sheet for Tracked Vehicles (T1)

- Special Functions:
  - . B1 = Fighting Vehicles or Vehicles with Integrated Assemblies
  - . B2 = Transport Vehicles
  - . B3 = Amphibious Vehicles
  - . B4 = Rocket or Missile Transporter

1. Identification and Classification:

- Project Name:
- Kind of Development (military, foreign, partly militarised, commercial materiel):
- Development Phase (Prototype, Preproduction, Series):
- Country/Manufacturer:
- Manufacturer's Model:
- First Model Production Year:
- Functions according to AVTP 00-07:
- Capabilities according to AVTP 00-07:

2. Crew, Ergonomics

- Number of Crew Members:
- Tasks of Crew Members:
- Permissible Range for Anthropometric Measures of Crew Members:

3. Main Data of the Weapon System

- B1) Main Weapon
  - . Type, Calibre:
  - . Type of Mounting:
  - . Range of Travel (Traversing/Elevating) [°]:
  - . Traversing and Elevating System:
- . B4) Guidance System:
- . Types of Ammunition:
- . Number of Rounds:
- . Fire Control System:
- . Operation Modes:
- B1) Secondary Weapons:
- B2) Weapons, Mountings:

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4. Main Data of the Chassis

- Type of Hull /Chassis:
- Type of Running Gear:
- Number of Road Wheels on each Side:
- Type of Wheel (single/double Wheel):
- Position of Final Drive:
- Mounting of Road Wheel Arm:  
(pushed/towed)
- Support Roller (Number, Position):
- Type of Track:
- Manufacturer, Model:
- Pitch of Track [mm]:
- Number of Sprocket Teeth:
- Type of Track Tensioning Device:
- Type of Spring:
- Type of Shock Absorbers:
- Number and Location of Damped Wheels:
- Manufacturer, Model:
- Type of Bump Stop:
- Number and Location of Wheels with Bump Stop:

5. Main Characteristics of Power-, Steering- and Braking System

- Engine
  - . Manufacturer, Model:
  - . Cycle Type (e.g. two stroke or four stroke)
  - . Type of Combustion: (e.g. spark-ignition or compression-ignition):
  - . Cooling System:
  - . Number of Cylinder/Cylinder Arrangement/V-Angle:
  - . Cubic Capacity (dm<sup>3</sup>):
  - . Type of Chargers (if applicable):
  - . Nominal Power/Nominal Speed [kW], [min<sup>-1</sup>]:
  - . Maximum Torque/Speed [Nm], [min<sup>-1</sup>]:
  - . Type of Exhaust Cleaning System:
  - . Type of Engine Control:
  - . Volume of Fuel Tanks [l]:
- Transmission
  - . Type of Clutch or Hydraulic Torque Converter:
  - . If applicable: Stall Torque Multiplication:
  - . Type of Transfer Gearbox:
  - . Manufacturer, Model:
  - . Number of Gears/Gear Ratios:
  - . Type of Steering Gearbox:
  - . Manufacturer, Model:

For combined transmission (transfer/steering) data of subcomponents are to be presented jointly.

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- . Input Power for Steering (before or after Torque Converter):
- . Type of Final Drive:
- . Manufacturer, Model:
- . Gear Ratio:
- Braking System
  - . Type of Service Brake:  
(Brakes, Brake Control)
  - . Type of Auxiliary Brake System:
  - . Type of Parking Brake System:
  - . Type of Retarder:
  - . Brake Control System:
- B3) Propulsion in Water
  - . Type of Propulsion:
  - . Manufacturer, Model:
  - . Type of Control of the Propulsion System:

6. Main Characteristics of Electrical Supply System, Internal Check System

- Electrical System
  - . Nominal Voltage [V]:
  - . Generator (Manufacturer, Model):
  - . Maximum Generator Power [kW]:
  - . Batteries, Number/Capacity [Ah]:
- Power Unit
  - . Type (Engine, Generator):
  - . Manufacturer, Model:
  - . Maximum Power [kW]:
- Internal Check System:

7. Protection - Main Characteristics

- Type of Armor:
- Armor Skirts:
- Security from Detection
  - . Visual:
  - . Thermal:
  - . Radar:
- NBC System
  - . Protected Ventilation (Manufacturer, Model)
  - . Warning Sensors
- System for Fire Warning and Extinguishing
  - . Type of Medium:
  - . Quantity of Medium [kg]:

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8. Command and Control System

- Main Optical Observation System:
- Radio Set (Manufacturer, Model, Number):
- Intercommunication System:
- Navigation System (Manufacturer, Model):
- Aids for Driving in Reverse:

9. Other Equipment

- Air Conditioning, Preheating System, Heating
  - . Air Conditioning/Heating, (Manufacturer, Model):
  - . Power for Cooling/Heating [kW]:
  - . Preheating Equipment:  
(Type, Components preheated)
- Deep Fording Equipment including Bilge Pumps:  
(Auxiliary Equipment, Preparation Time)
- Lifting, Dozing, Transporting Equipment, etc.
  - . Winch (Manufacturer, Model):
  - . Maximum Towing Force [kN]:
  - . Cable Length [m]
  - . Loading Crane (Manufacturer, Model):
  - . Maximum Lifting Force [kN]:
- Bulldozer Blade
  - . Mode of Operation:
  - . Width [mm]:
- Type of Outriggers:
- Towing Pintle (Manufacturer, Model):
- Eyes for Recovery, Tiedown and Lifting:  
(any Specialities)
- Accessories
  - . Camouflage Net (Dimensions):
  - . Traction Devices (Type, Number):

10. Dimensions, Weights

- Overall Length [mm]:
- Overall Width [mm]: } Ready for Operation
- Overall Height [mm]: }
- B1) Trunnion Height of Main Weapon [mm]:
- B2) Length of Personnel/Cargo Compartment [mm]:
- B2) Width of Personnel/Cargo Compartment [mm]:
- B2) Height of Personnel/Cargo Compartment [mm]:
- B2) Height of Floor (Storage Compartment) above Ground [mm]:
- Ground Clearance [mm]:
- Tread [mm]:



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- Overall Track Width [mm]:
- Contact Length of Track on Surface [mm]:
- Military Kerb Weight [kg]:
- B1) Combat Weight [kg]:
- B2) Payload [kg]:
- B2) Permissible Values for:
  - . Overall Weight [kg]:
  - . Towed Weight [kg]:
  - . Pintle Weight [N]:
- Power Pack Weight (to be lifted) [kg]:
- B1) Weight of Turret (to be lifted) [kg]:

11. Automotive Performance Data

- Minimum Speed [km/h]:
- Maximum Speed (forward) [km/h]:
- Maximum Speed (reverse) [km/h]:
- Time to Accelerate (from Idling/High Engine Speed)
  - . 0-30 km/h [s]:
  - . 0-50 km/h [s]:
  - . 0-Maximum Speed [s]:
- Maximum Drawbar Pull [kN]:
- Permissible Longitudinal Gradients for Driving [%]:
- Permissible Side Slope for Driving [%]:
- Capability of Ditch Crossing [m]:
- Capability of Climbing [m]:
- Minimum Turning Diameter [m]:
- Fording Depth without Preparation [m]:
- Fording Depth with Preparation [m]:
- Maximum Under-Water-Fording Depth [m]:
- B3) Maximum Speed through Water [km/h]:
- B3) Maximum Bollard Pull [kN]:

12. Performance Data of Weapon System, Protection, Control-System.

- Main Weapon
  - . Types of Ammunition:
  - . Maximum Firing Range [m]:
  - . Muzzle Velocity [m/s]:
  - . Firing Rate [Rounds/min]:
  - . Penetration Performance (NATO Standard Target):
- Protection against Standardised Round (Calibre)
  - . Front:
  - . Side, 15°:
  - . Side, 90°:
  - . Top:
- Command and Control System
  - . Ranges of Radio System:

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13. Consumption Data, Operational Limitations

- Average Fuel Consumption [l/100km]:
- Fuel Consumption at Engine Idle [l/h]:
- Driving Range [km]
- Maximum Permissible Ambient Temperature at Full Engine Power [°C]:
- Minimum Permissible Ambient Temperature for Engine Cold Start without Preheating, Battery 100% [°C]:
- Railway Gauges Cleared:
- Military Load Class (MLC):

14. Pictorial Presentations

- Photographs from different Angles:
  - . Front, right
  - . Front, left
  - . Right Side
  - . Left Side
  - . Front
  - . Back
  - . Above
  - . Power Pack
- Design Drawings:
  - . View from Above
  - . View from Front
  - . View from right Side

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ANNEX B

Manufacturer's Information Sheet for Wheeled Vehicles (T2)

- Special Functions:
  - . B1 = Fighting Vehicles or Vehicles with Integrated Assemblies
  - . B2 = Transport Vehicles
  - . B3 = Amphibious Vehicles
  - . B4 = Rocket or Missile Transporter

1. Identification and Classification:

- Project Name:
- Kind of Development (military, foreign, partly militarised, commercial materiel):
- Development Phase:  
(Prototype, Preproduction, Series)
- Country/Manufacturer:
- Manufacturer's Model:
- First Model Production Year:
- Functions according to AVTP 00-07:
- Capabilities according to AVTP 00-07:

2. Crew, Ergonomics

- Number of Crew Members:
- Tasks of Crew Members:
- Permissible Range for Anthropometric Measures of Crew Members:

3. Main Data of the Weapon System

- B1) Main Weapon
  - . Type, Calibre:
  - . Type of Mounting:
  - . Range of Travel (Traversing/Elevating) [°]:
  - . Traversing and Elevating System:
  - . B4) Guidance System:
  - . Types of Ammunition:
  - . Number of Rounds:
  - . Fire Control System:
  - . Operation Modes:
- B1) Secondary Weapons:
- B2) Weapons, Mountings:

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4. Main Data of the Chassis

- Type of Hull /Chassis:
- Type of Bodies:
- Number of Axles:
- Type of Axles (solid Axle, independent Suspension):
- Type of Tyre Configuration (single or dual Tyre):
- Formula of Wheel Drive:
- Number and Location of Axles with Steering Function:
- Type of Axle or Wheel Suspension:
- Type of Tyre, Tyre Dimension:
- Dimension of Rim:
- Required Tyre Pressure:
- Inflation Control System:
- Type of Shock Absorbers:
- Number and Location of Damped Wheels:
- Manufacturer, Model:
- Type of Bump Stop:
- Number and Location of Wheels with Bump Stop:

5. Main Characteristics of Power-, Steering- and Braking System

- Engine
  - . Manufacturer, Model:
  - . Cycle Type (e.g. two stroke or four stroke)
  - . Type of Combustion: (e.g. spark-ignition or compression-ignition):
  - . Cooling System:
  - . Number of Cylinder/Cylinder Arrangement/V-Angle:
  - . Cubic Capacity ( $\text{dm}^3$ ):
  - . Type of Chargers (if applicable):
  - . Nominal Power/Nominal Speed [ $\text{kW}$ ], [ $\text{min}^{-1}$ ]:
  - . Maximum Torque/Speed [ $\text{Nm}$ ], [ $\text{min}^{-1}$ ]:
  - . Type of Exhaust Cleaning System:
  - . Type of Engine Control:
  - . Volume of Fuel Tanks [ $\text{l}$ ]:
- Transmission
  - . Type of Clutch or Hydraulic Torque Converter:
  - . If applicable: Stall Torque Multiplication:
  - . Type of Transfer Gearbox:
  - . Manufacturer, Model:
  - . Number of Gears/Gear Ratios:
- Transfer Case
  - . Manufacturer, Model:
  - . Number of Gear/Gear Ratios:
  - . Type of Lockout System:
- Axle or Wheel Drive
  - . Type (Differential, Final Drive):
  - . Gear Ratios
  - . Type of Differential Lock
  - . Location of Axles with Differential Lock Systems:

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- Steering System:
  - . Type of Steering:
  - . Type of Steering Gear:
  - . Manufacturer, Model:
  - . Maximum angle of Steering Wheel, right/left [°]:
- Braking System
  - . Type of Service Brake:  
(Brakes, Brake Control)
  - . Type of Auxiliary Brake System:
  - . Type of Parking Brake System:
  - . Type of Retarder:
  - . Brake Control System(e.g. ABS):
- 83) Propulsion in Water
  - . Type of Propulsion:
  - . Manufacturer, Model:
  - . Type of Control of the Propulsion System:

6. Main Characteristics of Electrical Supply System, Internal Check System

- Electrical System
  - . Nominal Voltage [V]:
  - . Generator (Manufacturer, Model):
  - . Maximum Generator Power [kW]:
  - . Batteries, Number/Capacity [Ah]:
- Power Unit
  - . Type (Engine, Generator):
  - . Manufacturer, Model:
  - . Maximum Power [kW]:
- Internal Check System:

7. Protection - Main Characteristics

- Type of Armor:
- Security from Detection
  - . Visual:
  - . Thermal:
  - . Radar:
- NBC System
  - . Protected Ventilation (Manufacturer, Model)
  - . Warning Sensors
- System for Fire Warning and Extinguishing
  - . Type of Medium:
  - . Quantity of Medium [kg]:

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8. Command and Control System

- Main Optical Observation System:
- Radio Set (Manufacturer, Model, Number):
- Intercommunication System:
- Navigation System (Manufacturer, Model):
- Aids for Driving in Reverse:

9. Other Equipment

- Air Conditioning, Preheating System, Heating
  - . Air Conditioning/Heating, (Manufacturer, Model):
  - . Power for Cooling/Heating [kW]:
  - . Preheating Equipment:
    - (Type, Components preheated)
- Deep Fording Equipment including Bilge Pumps:
  - (Auxiliary Equipment, Preparation Time)
- Lifting, Dozing, Transporting Equipment, etc.
  - . Winch (Manufacturer, Model):
  - . Maximum Towing Force [kN]:
  - . Cable Length [m]
  - . Loading Crane (Manufacturer, Model):
  - . Maximum Lifting Force [kN]:
- Bulldozer Blade
  - . Mode of Operation:
  - . Width [mm]:
- Type of Outriggers:
- Towing Pintle (Manufacturer, Model):
- Eyes for Recovery, Tiedown and Lifting:
  - (any Specialities)
- Accessories
  - . Camouflage Net (Dimensions):
  - . Traction Devices:
    - (Type, Number)

10. Dimensions, Weights

- Overall Length [mm]: 7
- Overall Width [mm]: 1 Ready for Operation
- Overall Height [mm] : 1
- B1) Trunnion Height of Main Weapon [mm]:
- B2) Length of Personnel/Cargo Compartment [mm]:
- B2) Width of Personnel/Cargo Compartment [mm]:
- B2) Height of Personnel/Cargo Compartment [mm]:
- B2) Height of Floor (Storage Compartment) above Ground [mm]:
- Ground Clearance [mm]:
- Wheelbase(s) [mm]:

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- Distance of front axle from front of vehicle [mm]:
- Military Kerb Weight [kg]:
- B1) Combat Weight [kg]:
- B2) Payload [kg]:
- B2) Permissible Values for:
  - . Overall Weight [kg]:
  - . Towed Weight [kg]:
  - . Pintle Weight [N]:
- Power Pack Weight (to be lifted) [kg]:
- B1) Weight of Turret (to be lifted) [kg]:

11. Automotive Performance Data

- Minimum Speed [km/h]:
- Maximum Speed (forward) [km/h]:
- Maximum Speed (reverse) [km/h]:
- Time to Accelerate (from Idling/High Engine Speed)
  - . 0-30 km/h [s]:
  - . 0-50 km/h [s]:
  - . 0-80 km/h [s]:
  - . 0-Maximum Speed [s]:
- Maximum Drawbar Pull [kN]:
- Permissible Longitudinal Gradients for Driving [%]:
- Permissible Side Slope for Driving [%]:
- Capability of Ditch Crossing [m]:
- Capability of Climbing [m]:
- Minimum Turning Diameter [m]:
- Fording Depth without Preparation [m]:
- Fording Depth with Preparation [m]:
- B3) Maximum Speed through Water [km/h]:
- B3) Maximum Bollard Pull [kN]:

12. Performance Data of Weapon System, Protection, Control-System.

- Main Weapon
  - . Types of Ammunition
  - . Maximum Firing Range [m]:
  - . Muzzle Velocity [m/s]:
  - . Firing Rate [Rounds/min]:
  - . Penetration Performance (NATO Standard Target):
- Protection against Standardised Round (Calibre)
  - . Front:
  - . Side, 15°:
  - . Side, 90°:
  - . Top:
- Command and Control System
  - . Ranges of Radio System:

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13. Consumption Data, Operational Limitations

- Average Fuel Consumption [l/100km]:
- Fuel Consumption at Engine Idle [l/h]:
- Driving Range [km]
- Maximum Permissible Ambient Temperature at Full Engine Power [°C]:
- Minimum Permissible Ambient Temperature for Engine Cold Start without Preheating, Battery 100% [°C]:
- Railway Gauges Cleared:
- Military Load Class (MLC):

14. Pictorial Presentations

- Photographs from different Angles:
  - . Front, right
  - . Front, left
  - . Right Side
  - . Left Side
  - . Front
  - . Back
  - . Above
  - . Power Pack
- Design Drawings:
  - . View from Above
  - . View from Front
  - . View from right Side



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ANNEX C

Manufacturer's Information Sheet for Trailers (T3)

- Special Functions:
  - . B1 = Fighting Vehicles or Vehicles with Integrated Assemblies
  - . B2 = Transport Vehicles

1. Identification and Classification:

- Project Name:
- Kind of Development (military, foreign, partly militarised, commercial materiel):
- Development Phase:  
(Prototype, Preproduction, Series)
- Country/Manufacturer:
- Manufacturer's Model:
- First Model Production Year:
- Functions according to AVTP 00-07:
- Capabilities according to AVTP 00-07:

2. Crew, Ergonomics

- Number of Crew Members:
- Tasks of Crew Members:
- Permissible Range for Anthropometric Measures of Crew Members:

3. Main Data of the Weapon System

- Weapons, Mountings:

4. Main Data of the Chassis

- Type of Hull/Chassis:
- Type of Bodies:
- Type of Running Gear
- Number of Axles:
- Type of Axles (solid Axle, independent Suspension):
- Type of Tyre Configuration (single or dual Tyre):
- Number and Location of Axles with Steering Function:
- Type of Axle or Wheel Suspension:
- Type of Tyre, Tyre Dimension:
- Dimension of Rim:
- Required Tyre Pressure:
- Type of Shock Absorbers:
- Number and Location of Damped Wheels:
- Manufacturer, Model:
- Type of Bump Stop:
- Number and Location of Wheels with Bump Stop:

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5. Main Characteristics of Steering- and Braking System

- Type of Steering:
- Type of Service Brake (Brakes, Brake Control):
- Type of Auxiliary Brake System:
- Type of Parking Brake System:
- Type of Retarder:
- Brake Control System:

6. Main Characteristics of Electrical Supply System, Internal Check System

- Electrical System
  - . Nominal Voltage [V]:
  - . Electrical Power Supply:
  - . Batteries, Number/Capacity [Ah]:
- Power Unit
  - . Type (Engine, Generator):
  - . Manufacturer, Model:
  - . Maximum Power [kW]:
- Internal Check System:

7. Protection - Main Characteristics

- Type of Armor:
- Security from Detection
  - . Visual:
  - . Thermal:
  - . Radar:
- NBC System
  - . Protected Ventilation (Manufacturer, Model)
  - . Warning Sensors

8. Command and Control System

- Intercommunication System:

9. Other Equipment

- Air Conditioning, Preheating System, Heating
  - . Air Conditioning/Heating, (Manufacturer, Model):
  - . Power for Cooling/Heating [kW]:
  - . Preheating Equipment (Type, Components preheated):
- Eyes for Recovery, Tiedown and Lifting:  
(any Specialities)

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- Accessories
  - . Camouflage Net (Dimensions):
  - . Traction Devices (Type, Number):

10. Dimensions, Weights

- Overall Length [mm]: 7
- Overall Width [mm]: } Ready for Operation
- Overall Height [mm]: }
- B2) Length of Personnel/Cargo Compartment [mm]:
- B2) Width of Personnel/Cargo Compartment [mm]:
- B2) Height of Personnel/Cargo Compartment [mm]:
- B2) Height of Floor (Storage Compartment) above Ground [mm]:
- Ground Clearance [mm]:
- Wheelbase(s) [mm]:
- Distance of front axle from front of vehicle [mm]:
- Military Kerb Weight [kg]:
- B1) Combat Weight [kg]:
- B2) Payload [kg]:
- B2) Permissible Value for Overall Weight [kg]:

11. Automotive Performance Data

- Maximum Permissible Speed [km/h]:
- Permissible Longitudinal Gradients for Driving [%]:
- Permissible Side Slope for Driving [%]:
- Capability of Ditch Crossing [m]:
- Capability of Climbing [m]:
- Minimum Turning Diameter [m]:
- Fording Depth without Preparation [m]:

12. Performance Data of Weapon System, Protection, Control-System.

- not applicable

13. Consumption Data, Operational Limitations

- Railway Gauges Cleared:
- Military Load Class (MLC):

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14. Pictorial Presentations

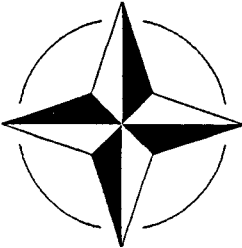
- Photographs from different Angles:
  - . Front, right
  - . Front, left
  - . Right Side
  - . Left Side
  - . Front
  - . Back
  - . Above
  - . Power Pack
- Design Drawings :
  - . View from Above
  - . View from Front
  - . View from right Side

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VEHICLE TESTING  
PUBLICATION

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NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : GENERAL EVALUATION PROCEDURES

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : ITOP NO.: 2-2-509(1)

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP contains a general  
outline on evaluation and two  
examples (RAM, Rating Scales).

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1

AVTP : 00-09  
EDITION NO.: FINAL  
DATE : SEP. 1991

NORTH ATLANTIC TREATY ORGANISATION  
MILITARY AGENCY FOR STANDARDIZATION (MAS)

NATO LETTER OF PROMULGATION

1. NATO AVTP "GENERAL EVALUATION PROCEDURES" (00-09) is a NATO UNCLASSIFIED publication. Periodic accounting is not required.
2. AVTP: 00-09 is effective NATO-wide on receipt.
3. It is permissible to copy or to make extracts from this publication without the consent of the Authorising Agency.
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6. Any ratifying nation may issue supplemental testing information to amplify or clarify these procedures, but in no case will such information contravene the provisions of this AVTP. If a ratifying nation must deviate from a provision of this AVTP due to constraints such as available facilities, national regulations, instrumentation accuracies, etc., the test methods used will be described in the report. However, such deviation may cause nonacceptance of test data by other nations.

FOR THE MILITARY AGENCY OF STANDARDIZATION

(Signature)

AVTP : 00-09  
EDITION NO.: FINAL  
DATE : SEP. 1991

RECORD OF CHANGES, AMENDMENTS AND RESERVATIONS \*)

Identification of Change or Amendment and Reg.No.(if any) and date	Date Entered	NATO Effective Date	By whom entered Signature, Rank, Grade or Rate, Name of Command

\*) See Reservations Overleaf

AVTP : 00-09  
EDITION NO.: FINAL  
DATE : SEP. 1991

Trial Series: GENERAL SUBJECTS

Test Title : GENERAL EVALUATION PROCEDURES  
(Examples: RAM Data and Subjective Rating Scales)

Paragraph 1. SCOPE  
2. GENERAL  
2.1 Test Information  
2.2 Evaluation

ANNEX A: Example Calculation of RAM Indices

ANNEX B: Rating Scales



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1. SCOPE

This AVTP provides a general discussion of the evaluation of data collected during testing of wheeled and tracked vehicles. Also, it will provide examples of techniques which can be applied to this data in order to make it useful for evaluation.

This discussion will be restricted to evaluation of test data as it relates to test criteria and issues and will not discuss the evaluation of a system as it relates to the overall acquisition decision for an item of military equipment (i.e., support costs, combat effectiveness, etc.).

2. GENERAL

2.1 Test Information

The purpose of testing military materiel is, usually, to collect specific data as a prerequisite to determining that the materiel will be acceptable and useful to the user in terms of meeting or exceeding user requirements, and that it will have the characteristics necessary to accomplish the expected mission.

This test data can be either quantitative or qualitative. Quantitative data is data that is measurable in terms of a specific quantity. Examples of quantitative data are speed, distance, force, events, etc., which are measurable by appropriate instrumentation or observation. Qualitative data is subjective opinion of an unmeasurable property or characteristic. Examples of qualitative data are comfort, ease of use, preference, soldier acceptance, etc., which cannot be directly measured or observed.

2.2 Evaluation

Evaluation of test data as it relates to testing of wheeled and tracked vehicles (and most other military materiel) is the determination of the significance of the data in relation to a set of criteria and/or issues established by appropriate authority which defines the required capabilities and characteristics of the system under test. Evaluation of test data must not be confused with the presentation of test data.

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Evaluation of test data can be a direct comparison of the data or datum to a criterion or an issue, with a conclusion about whether the data or datum failed to meet, met or exceeded the criterion or answered the issue, and a statement concerning the significance of this result on mission performance of the item under test.

Often, mathematical formulas or techniques must be used to develop information from test data in order to put it in a form which will allow comparison to criteria, answer test issues and determine the significance of the test data as it relates to mission performance.

APPENDIX A, RAM Indices, is an example of a way in which quantitative test data is developed using formulas, to get it in a form which will allow determination of the significance.

APPENDIX B, Rating Scales, is an example of a way in which qualitative test data is acquired and developed, using mathematical techniques, to put it in a form which will allow determination of the significance.

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ANNEX A

Example Calculation of RAM Indices

Note: It should be noted that the following example, whilst demonstrating a technique of data evaluation for a particular test, does not imply that this is the NATO approved method of RAM data evaluation

1. References:

For information related to producing and acquiring RAM test data see the following AVTP's:

02-10, Vehicle Maintenance

11-10, Endurance Testing of Wheeled and Tracked Vehicles

11-20, Collection and Reporting of Reliability, Availability, Maintainability and Durability (RAM-D) Data for Wheeled and Tracked Vehicles.

2. The times associated with the RAM-relevant operation and maintenance of the test item or items are assigned to categories as shown:

- Time item is functional,  $t_1$ 
  - Time on stand by while functional,  $t_3$
  - Time item is in operation,  $t_4$
- Time item is not functional,  $t_2$ 
  - Time for unscheduled maintenance,  $t_5$
  - Time for scheduled maintenance,  $t_6$
  - Time for delays,  $t_7$
  - Time for technical changes,  $t_8$

NOTES:

a. If, during scheduled maintenance, an actual or potential failure is discovered that warrants corrective work, the additional work will be unscheduled maintenance,  $t_5$ .

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b. Time  $t_7$  can not be measured at a proving ground in a way that would be meaningful to field use of the item, since  $t_7$  includes time waiting for parts, administrative delays, etc. A  $t_7$  time is best obtained from logisticians.

c. If times for scheduled maintenance, unscheduled maintenance and/or logistic delay ( $t_5$ ,  $t_6$  and  $t_7$ ) overlap, the overlapping time will only be counted once in the calculation of availability.

d. Time to perform technical changes ( $t_8$ ) is not normally included in hardware evaluation. Replacement of a defective part by a modified part is to be charged to  $t_5$ . Replacement of a functional part by a modified part is to be charged to  $t_8$ .

Figure A-1 presents these time categories in a pie chart format where  $t_0$  is total test time ( $t_1 + t_2$ ).

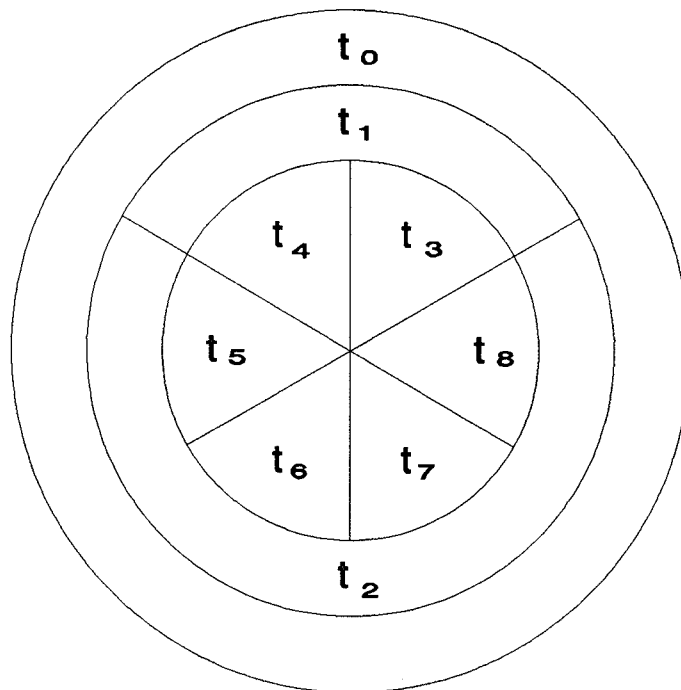


Figure A-1, Pie Diagram for RAM-Relevant Test Time

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3. Examples of Formulae for RAM Indices.

MEAN TIME BETWEEN FAILURES (MTBF): A basic measure of reliability for repairable items; the mean number of life units during which all parts of the item perform within their specified limits, during a particular measurement interval under stated conditions.

$$MTBF = \frac{\text{Total operating time } t_4}{\text{Total number of failures during time } t_4}$$

This expression may be used for all types of failures (i.e., mission failures and nonmission failures). The definitions of "Operating Time" and "Failure" must be determined before the start of testing.

INHERENT AVAILABILITY ( $A_i$ ): A measure of availability which includes only the effects of an item design and its application, and assumes an ideal operation and support environment.

$$A_i = \frac{t_4}{t_4 + t_5}$$

ACHIEVED AVAILABILITY ( $A_a$ ): Similar to  $A_i$  but takes into account scheduled maintenance. Used when the item is not operating in its intended support environment (e.g., proving ground tests).

$$A_a = \frac{t_4}{t_4 + t_5 + t_6}$$

OPERATIONAL AVAILABILITY ( $A_o$ ): A measure of availability which includes the combined effects of item design, installation, quality, environment, operation, maintenance and repair.

$$A_o = \frac{t_3 + t_4}{t_3 + t_4 + t_5 + t_6 + t_7}$$

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MAINTENANCE RATIO (MR): A measure of the total maintenance manpower burden required to maintain an item. It is expressed as the cumulative number of manhours of maintenance expended in direct labor during a given period divided by the cumulative number of end item life units during the same period.

$$MR = \frac{t_5 + t_6}{t_4} \text{ mmh/life unit}$$

For this formula  $t_5$  and  $t_6$  are expressed in terms of maintenance man-hours (mmh), as opposed to clock hours, and  $t_4$  is expressed in terms of life units (e.g., operating hours, miles). This is often most useful if it is calculated for each maintenance echelon rather than overall maintenance burden as this will allow evaluation of the distribution of the maintenance burden.

MEAN TIME TO REPAIR (MTTR): The sum of corrective maintenance times divided by the total number of corrective maintenance actions during a given period of time under stated conditions.

$$MTTR = \frac{\text{Total unscheduled maintenance time, } t_5}{\text{Total number of unscheduled maintenance tasks performed during the test}}$$

This can also be calculated for the various echelons of maintenance.

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ANNEX B

Rating Scales

1. The rating scale is used to give a numerical value to a judgement, and provides an objective method for rating attitudes and opinions. When properly constructed, the rating scale accurately reflects both the direction and intensity of differences of attitude-or opinion. The results obtained are amenable to analysis by parametric and non-parametric statistic techniques. Rating scales are used in the form of questionnaires to the test participants.

The scale must be continuous from best to worst and the intervals must appear to be equal to the responder.

Rating scales are most useful in testing of the ergonomic characteristics of an item. See AVTP series 09, Ergonomics.

2. The following are examples of standardized rating scales which may be used in the construction of a questionnaire concerned with such subjective characteristics as overall acceptability, ease of operation, ease of maintenance, utility and compatibility. These scales were developed from a U.S. Army study using a large military population to place adjectives in relation to each other and then calculating the mean and standard deviation of the positions. The scales were developed by selecting intervals which are close to equal and have small standard deviations.

- a.
  - 9 - Excellent
  - 8 - Extremely good
  - 7 - Very good
  - 6 - Good
  - 5 - Adequate
  - 4 - Barely adequate
  - 3 - Not quite adequate
  - 2 - Poor
  - 1 - Extremely poor

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- b. 7 - Much easier  
6 - Easier  
5 - Slightly easier  
4 - About the same  
3 - Slightly more difficult  
2 - Difficult  
1 - Much more difficult
- c. 6 - Extremely Good  
5 - Very good in most respects  
4 - Moderately good  
3 - Barely adequate  
2 - Poor  
1 - Extremely poor

The 6-point scale is preferred. The 9-point scale may be too complex (except perhaps, for food) and the 7-point scale allows an answer which is equivalent to "no opinion" by offering a mid-point.

The development and use of even-appearing intervals for questionnaires is an attempt to allow statistical analysis of subjective data. This is done using the frequency of occurrence of the numbers which identify each interval. A few of the valid statistical techniques for this analysis are:

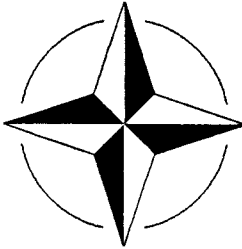
- (1) K-S Test, t-Test (2 samples; independent)
- (2) Wilcoxon Test (2 samples; dependent)
- (3) Kruskal-Wallis (more than 2 samples; independent)
- (4) Friedman Test (more than 2 samples; dependent)

The tests should be done at the 0.05 significance level.



ALLIED  
VEHICLE TESTING  
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NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : LIST OF TEST FACILITIES

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP contains a list of Test Facilities designated for vehicle testing in the countries of Belgium, Canada, France, Germany, Italy, Netherlands, United Kingdom and United States.

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NORTH ATLANTIC TREATY ORGANISATION  
MILITARY AGENCY FOR STANDARDIZATION (MAS)

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Identification of Change or Amendment and Reg.No.(if any) and date	Date Entered	NATO Effective Date	By whom entered Signature, Rank, Grade or Rate, Name of Command

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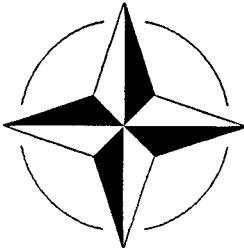
Test Title : LIST OF TEST FACILITIES\*

COUNTRY	NAME	Address
Belgium	TDLM-CE Quartier Est.	St. Jobsesteenweg B-2130 BRASSCHAAT
France	Etablissement Technique d'Angers (ETAS)	B.P. 4107 F-49041 ANGERS CEDEX
Canada	Land Engineering Test Establishment	MGen Pearkes Building OTTAWA, KIA0 K2
Germany	Wehrtechnische Dienst- stelle für Kraftfahr- zeuge und Panzer (WTD 41)	Kolonnenweg D-54296 TRIER-Grüneberg
	Wehrtechnische Dienst- stelle für Pionier- Truppengerät (WTD 51)	Winninger-Str. 15 D-5400 KOBLENZ
Italy	Centro Technico della Motorizzazione	MONTELIBRETTI-ROMA
Netherland	Hoofd Sectie Beproevingen MBA-Z/DMKL	Westerstraat 62 NL-4635 RX HUYBERGEN
United Kindom	Royal Armament Research and Development Establishment (RARDE)	Chobham Lane CHERTSEY Surrey KT16 0EE
United States	Aberdeen Proving Ground (APG)	Aberdeen Proving Ground MD 21005
	Yuma Proving Ground (YPG)	Yuma Proving Ground AZ 85365-9103

\*Detailed information is available from the above addresses.

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NATO INTERNATIONAL STAFF-DEFENCE SUPPORT DIVISION

TRIAL SERIES : GENERAL SUBJECTS

TEST TITLE : VALIDATION OF  
TEST PROCEDURES

REFERENCE : STANAG 4357  
STANAG 4358

EQUIVALENT : -

FOR COMPLIANCE  
WITH : -

ABSTRACT : This AVTP describes the procedures  
for AVTP-validation. The ANNEX de-  
scribes a procedure for measuring  
the severity of a test course.

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NORTH ATLANTIC TREATY ORGANISATION  
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6. Any ratifying nation may issue supplemental testing information to amplify or clarify these procedures, but in no case will such information contravene the provisions of this AVTP. If a ratifying nation must deviate from a provision of this AVTP due to constraints such as available facilities, national regulations, instrumentation accuracies, etc., the test methods used will be described in the report. However, such deviation may cause nonacceptance of test data by other nations.

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Test Title : VALIDATION OF TEST PROCEDURES

Paragraph 1. SCOPE

2. GENERAL DISCUSSION

3. VALIDATION PROCEDURE

3.1 Facilities and Instrumentation

3.2 Required Test Conditions

3.3 Test Procedure

3.4 Data Required

3.5 Presentation of Data

ANNEX A MEASUREMENT OF TEST COURSE SEVERITY



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1. SCOPE

This AVTP describes the procedures for AVTP validation, when these procedures should be requested and how these procedures should be accomplished. Also, the ANNEX to this AVTP describes a procedure for measuring the severity of a test course for the purpose of comparison with another test course.

2. GENERAL DISCUSSION

The aim of validation of an AVTP is to demonstrate that an AVTP, when used in a test program, will generate test data which are acceptable to the nation running the test program, to all other nations participating in the test program (if any) and, generally, to any nation interested in the results but not directly involved in the test program. This validation is performed using the procedure described in Paragraph 3.

The validation procedure may determine that the AVTP is satisfactory as written or it may determine that the AVTP needs to be updated to correct inadequate procedures, redefine areas where there is misunderstanding between nations, or incorporate new techniques or procedures. The validation may also indicate areas requiring supplemental research.

Successful unilateral use of an AVTP by a nation in a test program will constitute validation of the AVTP for use by that nation. A validation program will consist of two or more nations combining in an effort to assure that the data generated in those nations using identical test procedures from an AVTP and the same test vehicle is equivalent and acceptable to all participants.

If a unilateral test program or a multinational validation program indicates that an AVTP needs to be updated with new or supplemental information, a report of these results must be prepared and distributed. A report of a multinational validation program must be sent even if the results of the program indicate that no changes to the AVTP's are required. This report of a multinational validation will be important in the consideration of validation programs by other nations and to confirm the appropriateness of the test procedures for international use.

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Reports will be sent to the national points of contact listed in STANAG 4357 and to:

NATO  
AC/225 (Panel II)  
1110 Brussels  
BELGIUM

Validation of test procedures among nations is a lengthy and expensive undertaking. Acceptance of the AVTP's by the nations ratifying STANAG 4357 was not contingent on a physical validation of those procedures. There should be some indication that a problem with the procedure exists before initiating a multinational validation program.

3. VALIDATION PROCEDURE

3.1 Facilities and Instrumentation

Facilities and instrumentation as indicated in the AVTP's to be validated must be used. Supplemental research may identify the requirement for facilities and instrumentation not defined in existing AVTP's. The description of any additional facilities and/or instrumentation required must be included in the report.

3.2 Required Test Conditions

The test conditions must be the same as those required by the AVTP's to be validated.

If test conditions other than those required by the AVTP's are used these must be described in the report and reasons provided for using different conditions (e.g., supplemental research, improved test procedures, etc.).

For validation of AVTP's among nations the same test vehicle which is used by one nation must be used at the test facilities of the other nations involved in the validation program in order to assure comparable test data.

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3.3 Test Procedure

The test procedures used must be identical to those required by the AVTP being validated. Any change of test procedures (e.g., for supplemental research or improved techniques) must be documented in the report.

3.4 Data Required

The data gathered must be that which is required by the AVTP being validated. Any change of or addition to the data required (e.g., for supplemental research or improved techniques) must be documented in the report.

3.5 Presentation of Data

Present the required data in narrative, tabular, graphical, pictorial or other format as specified by the AVTP being validated.

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ANNEX A

MEASUREMENT OF TEST COURSE SEVERITY

- Paragraph
1. BACKGROUND
  2. FACILITIES AND INSTRUMENTATION
    - 2.1 Facilities
    - 2.2 Instrumentation
  3. REQUIRED TEST CONDITIONS
    - 3.1 Test Reference Vehicle
    - 3.2 Test Courses
  4. TEST PROCEDURES
    - 4.1 Inspection of Test Courses
    - 4.2 Reference Vehicles Runs
  5. DATA REQUIRED
    - 5.1 Data from Inspection of Courses
    - 5.2 Data from Vehicle Runs
  6. PRESENTATION OF DATA

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1. SCOPE

Endurance test results are influenced by the severity of test courses. If a comparison of test courses of different nations is desired or necessary for the test program this ANNEX describes procedures to measure the relative severity of test courses based on inspection of the test courses and the response parameters of power train, suspension and steering of a reference vehicle in order to determine comparability of various test courses and thereby determine the comparability of test data.

2. FACILITIES AND INSTRUMENTATION

2.1 Facilities

Facilities will consist of the test courses to be compared. They include at least paved and secondary roads, level and hilly cross country courses, and Belgium Block.

2.2 Instrumentation

For the procedure the following instrumentation is necessary:

<u>DEVICES FOR MEASUREMENT OF:</u>	<u>PERMISSIBLE ERROR OF MEASUREMENT*</u>
a. Road wheel travel, second right side (tracked vehicles)	5 %
Suspension travel of one wheel (wheeled vehicles)	
b. Final drive or drive shaft speed	5 %
c. Final drive or drive shaft torque	5 %
d. Steering wheel deflection	2 %

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e. Soil conditions

(1) Soil moisture content	2 %
(2) Cone index	10 %
(3) Soil density	5 %
(4) Fine grain distribution	1 %

f. Ambient temperature 1 °C

g. Road speed 5 %

h. Driver's seat acceleration 2 %

\* The permissible error of measurement for instrumentation is the two-sigma value for a normal distribution; thus, the stated errors should not be exceeded in more than 1 measurement of 20.

3. REQUIRED TEST CONDITIONS

In order to compare test course severity it is necessary to select a reference vehicle to be used. The same vehicle must be used to measure all test courses to be compared. Vehicle condition must be kept constant throughout the procedure. If possible, the measurements should be taken in similar seasonal conditions.

4. TEST PROCEDURE

4.1 Inspection of Test Courses

Test courses are to be inspected visually and using maps indicating the slopes, curves and distances for the test course. Cone index readings and soil samples are taken. AVTP 03-100 contains the Unified Soil Classification table.

4.2 Reference Vehicle Runs

Run the reference vehicle at maximum safe speed in the clockwise and counter-clockwise direction on all test courses to be compared. Repeat the runs 3 times. Record the required data.

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5. DATA REQUIRED

5.1 Data from Inspection of Courses

- a. Maps with curves and slopes.
- b. Fine grain soil distribution.

5.2 Data from Vehicle Runs

- a. Travel of selected wheel.
- b. Drive-shaft speed.
- c. Drive-shaft torque.
- d. Steering deflection.
- e. Time for length of lap.
- f. Description of data acquisition system.
- g. Ambient temperature and weather conditions for each run.
- h. Gear range for vehicle run.
- i. Left and right final drive horsepower (tracked vehicles).
- j. Total horsepower.
- k. Driver's absorbed power (ride quality).

6. PRESENTATION OF DATA

Present the required data in narrative, tabular, graphical, pictorial or other format as appropriate. Include the root-mean-square (rms) value of the reference vehicle response parameters and the ranking order of courses by weighing the rms values.